

SCIENCE

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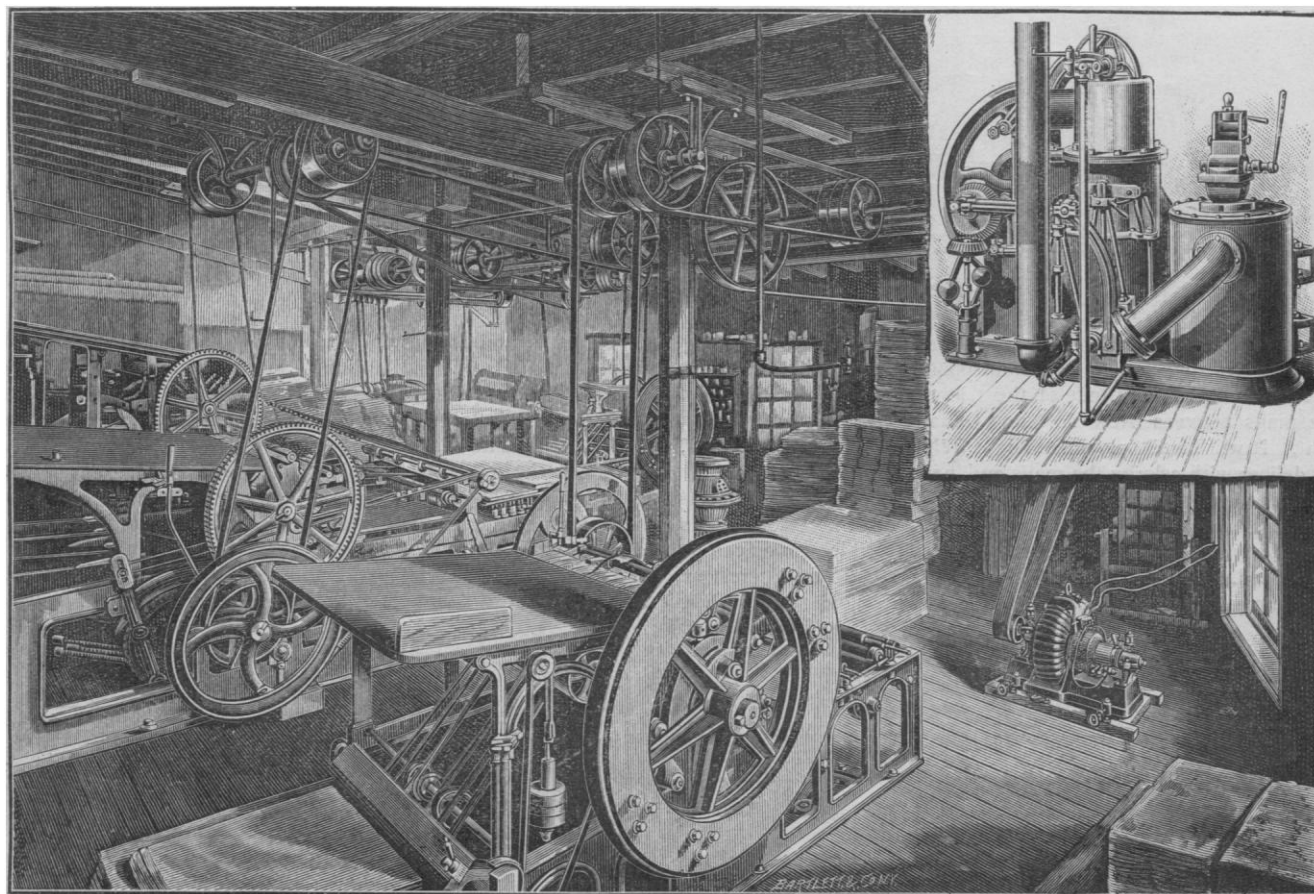
ELECTRIC MOTORS IN PRINTING-OFFICES.

ONE of the many uses found for the electric motor is to furnish power for running printing-presses. There are quite a number of them used for that purpose in this city; and so well and economically do they work, that a rapid development of the electric-motor trade in that direction is now going on, not only in New York, but in all parts of the country.

A recent installation of electric motors in the press-room of a newspaper of wide circulation is worthy of notice. Some weeks

sult, the *Washington Star* of June 29, as well as the subsequent issues, were printed upon electrically driven presses.

The machinery of the press-room shown in the picture on this page, that of a firm of printers in this city, is driven by the little 5-horse-power C. & C. motor shown in the lower right-hand corner, which displaced the large hot-air engine shown in the view above it. The machinery in the office consists of five large and three small printing-presses, a 28-inch paper-cutter, and a pump 2.5 by 8 inches, lifting water forty feet. Where there are many small industries in a limited area, as is the case in all large cities, the



C. & C. ELECTRIC MOTOR OPERATING THE MACHINERY OF A PRINTING-OFFICE.

ago the walls of the *Washington Star*'s press-room gave way, ruining the steam-engine, throwing the shafting out of place, and completely disabling the office. The only means of quickly resuming work that could be thought of was to put in an electric motor of sufficient power, thus rendering the presses independent of engine and shafting. The Washington agent of the C. & C. Electric Motor Company of this city, being appealed to, telegraphed at once for a 15-horse-power motor, which was shipped immediately, installed, connected with an electric-light circuit, and started up. As a re-

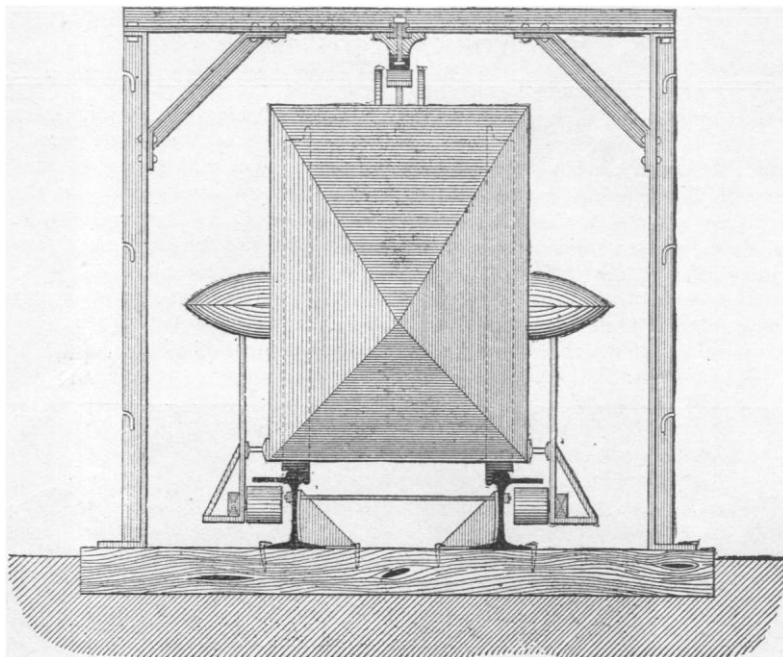
sult, the *Washington Star* of June 29, as well as the subsequent issues, were printed upon electrically driven presses. The machinery of the press-room shown in the picture on this page, that of a firm of printers in this city, is driven by the little 5-horse-power C. & C. motor shown in the lower right-hand corner, which displaced the large hot-air engine shown in the view above it. The machinery in the office consists of five large and three small printing-presses, a 28-inch paper-cutter, and a pump 2.5 by 8 inches, lifting water forty feet. Where there are many small industries in a limited area, as is the case in all large cities, the electric motor is peculiarly economical. Instead of a number of steam-plants scattered about in different buildings, one large engine with dynamos can supply electric current to a great number of motors, each using only the power required, and none wasting power when idle. Besides supplanting small steam, gas, and hot-air engines, the electric motor is in many places opening out a new field for itself as a substitute for foot and hand power in several branches of industry, its compactness and cleanliness being strongly in its favor.

THREE MILES A MINUTE.

THE following account is sent us by the company interested, of what is claimed to be a great railway invention for the transportation of mails and light freight. The Weems railway system, incorporated under the name of the Electro-Automatic Transit Company of Baltimore, has patented its multiplicity of electrical and mechanical appliances in the United States and all over the world as a preliminary to putting the system regularly to work wherever required. By this electro-automatic arrangement the morning

in the surface of the ground over which the road passes. The mail and express cars are telescoped in forming a train, the former into the end of the motor-car, and the latter into that of the one preceding it, forming a flexible train of cars, offering an unbroken surface to the air. The rear end of the rear car is pointed in a similar manner to the front of the motor-car, thus preventing any suction as the train rushes on its way. The motor may pull one car or a train of cars.

All trains will be controlled from a generating station, where will be placed an electrical generating plant. Electrical brakes are

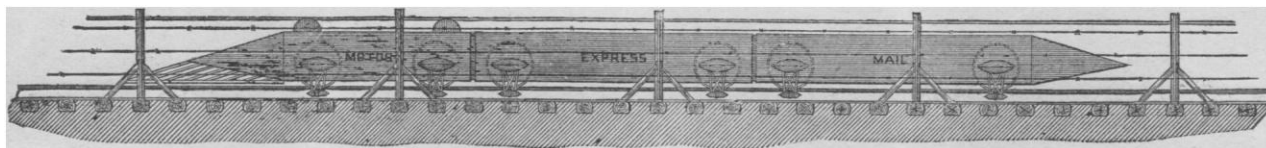


END VIEW OF THE WEEMS ELECTRO-AUTOMATIC RAILWAY.

papers may be delivered for the breakfast-table, and the evening papers before supper-time, at distant points. It will deliver letters almost with the promptitude of the telegraph sending a message. The mails between New York and Omaha will be carried in a night. It will handle perishable light freight from long distances, will deliver with celerity the mails and parcels in cities and suburban towns, and will multiply many times the business of the post-office and express companies. Its advantages are not alone in its speed, but in the economy and frequency with which trains can be despatched. In addition to all these things, it will save interest on remittances at long distances, will bring the people closer together,

to be used, and trains are started, stopped, speed lessened, and backed at will from the station. Special appliances will inform the operator in charge of the generating station of the exact location of the train from the time it leaves or passes any given point until it reaches its destination. It has not yet been determined how far apart the generating stations shall be placed. Possibly 100 miles may not be out of range, as the current can be run for 50 miles each way from the station as a centre without much loss of electricity.

The patents of the company number 143 in the United States and the principal countries of the world, covering the vital details



THE WEEMS ELECTRO-AUTOMATIC RAILWAY.

and will create new enterprises. Doubtless, as in the case of the telegraph, its important uses cannot be anticipated in advance of its going into active operation. Its development will create new fields of usefulness not now thought of. Such, in brief, are what the persons interested in this invention claim for it.

The motor-car is 18 feet long and 2½ feet square at each end. It is pointed in front, the wedge or point being below the longitudinal centre, adjusting it to the air pressure, thus keeping the car down to the track. To reduce atmospheric friction to a minimum, all wheels and electrical appliances are placed within the walls of the cars. The road is to be built on the surface of the ground, with track of 24 inches gauge, and will cost about \$5,000 per mile. In thickly settled districts the road can be elevated, the varied length of the uprights being a cheap mode of covering irregularities

of this novel system. The principles patented involve special form of rail, making it impossible for trains to jump the track at any rate of speed; form of electrical safety rail, carrying the outgoing current and returning the same on the same rail (this rail can be crossed by pedestrians or vehicles with perfect safety); form of conductors and rails combined, with insulation of the same for carrying currents over long distances; means of starting, stopping, backing, and controlling trains from the generating stations; method of regulating the electrical current automatically on trains while in motion, increasing the power in ascending and decreasing the same in descending grades; means whereby trains automatically register themselves at every station as they pass every mile of track; form of journals and boxes for fast speed to avoid heating; reducing the air pressure at high speed to a mini-

mum by pointed cars splitting the air in front, and preventing suction in the rear, while in transit; reducing the cross-section of cars to a minimum, and enclosing the wheels and electrical equipment within the walls of the same to offer as little resistance to the air as possible; telescoping the cars of a train to present to the air an unbroken surface; special switch for rails; keeping the centre of gravity of the whole train below the axles. Patents have also been secured for a passenger system which applies to the conversion of existing steam railroads into electric railroads, which cover the only safe mode of rapid transit for passengers.

A series of experiments have been made at Laurel, Md., to show what the Weems railway system will do. This experimental line is a circuit of exactly two miles. Over this route there are 29 changes of grade, some of them very heavy, even to the extent of 108 feet to the mile. The generating plant there contains all the electrical appliances necessary to the attainment of high speed by a railroad-train. There is also special machinery for experimentation, and the perfecting of all mechanical and electrical inventions tending to advance and improve the system. All tests of speed have been made upon heavy grades and curves combined, too great ever to be required in the construction of a commercial line: therefore the experiments demonstrate the high rate of speed which will be obtained upon lines built for business purposes. At this experiment station 2 miles per minute are made around a heavy curve, or the equivalent of 180 miles an hour, or 3 miles a minute, on a level track. Prior to the inauguration of this system, 20 miles per hour was the fastest time ever made by any kind of electrical railroad travel.

At the experiment station there are no extensive works; and the motor-car, when it comes out from under its shed in obedience to the will of the engineer in the distant plant building where the electric dynamo generates the current, moves deliberately, slowly, and with absence of all sound. This cigar-shaped car, painted a bright red and moving sharp end foremost, at first sight does not seem a wonderful thing as it goes quietly along the track; but later, when the engineer at the dynamo puts on more power, or, as a steam-car man would say, more steam, and the creeping thing on the ground hastens its movement until it fairly flies, and becomes a moving speck of red, spectators feel the progress being made in applied science, and talk of the wonders of electricity, and the great things it will accomplish in the active affairs of life in the near future. All who have witnessed the successful trials at Laurel are impressed with the great stride made in the matter of rapid transit by electricity.

Arrangements are now being made for the building of an extended road between distant cities, and Baltimore will be one of the stopping-points on the line.

The officers of the Electro-Automatic Transit Company of Baltimore City are Dr. Julian J. Chisolm, president; O. J. Smith of New York, vice-president; Alex. Brown, treasurer; William M. Pegram, secretary; David G. Weems, general manager; J. J. Chisolm, Edward B. Bruce, B. F. Gambrill, O. J. Smith, Robertson Taylor, Franklin J. Morton, Alex. Brown, S. E. George, William M. Pegram, Edwin F. Abell, David G. Weems, directors.

Mr. David G. Weems of Baltimore is the inventor of the system. Mr. O. J. Smith, the vice-president, is president of the American Press Association of New York. The officers of the company have made frequent visits to witness the various trials, and with each successful increase of speed made have enlarged their expectations of future results.

WHO ARE THE AMERICAN INDIANS?¹

WHEN Columbus discovered America, he discovered not only a new continent, but a new people, — the American Indians. From one end to the other of its broad expanse the continent was occupied by Indian tribes that had held the land from time immemorial, — so far, at least, as their own traditions aver, — knowing nothing of any country but their own. The commonly presented picture of the Indians as they appeared at the time of the discovery is that of a horde of wandering savages, half or wholly naked, living on roots and herbs, or existing by the capture of wild animals scarcely

more savage than themselves, and the chief object of whose existence was to enslave, to torture, and to kill each other. Those who hold such opinions have ever taken a hopeless view of the Indian's present, and a still more hopeless view of his future. Such a picture conveys a totally false impression of the Indian, and of the state of culture to which he had attained at the era of the discovery. Though still living in savagery, he was in the upper confines of that estate, and was fast pressing upon the second stage of progress, — that of barbarism; that is to say, he had progressed far beyond and above the lowest states in which man is known to live, to say nothing of the still lower conditions from which he must have emerged, and had travelled many steps along the long and difficult road to civilization.

Already he had become skilful in the practice of many arts. Though the skins of beasts furnished a large part of his clothing, he had possessed himself of the weaver's art; and from the hair of many animals, from the down of birds, and from the fibres of many plants, he knew how to spin, to weave, and to dye fabrics. Basket-making he had carried to so high a degree of perfection that little further improvement was possible. The potter's art also was his; and, though his methods were crude and laborious, the results achieved, both as regards grace of form and ornamentation, may well excite admiration at the present day.

Copper had been discovered, and was mined and roughly beaten into shape to serve for ornament, and, to some slight extent, for mechanical use. In Mexico and Peru, gold, silver, and copper were worked; and many authors contend that the method of making bronze, an invention fraught with tremendous possibilities, had there been discovered.

In much of South and Central America, Mexico, and the eastern parts of the United States, so important an advance had been made in agriculture that it furnished a very large part of the food-supply, and it should not be forgotten that the chief product of the Indian's tillage, maize or Indian-corn, which to-day furnishes a large part of the world's food, was the gift of the Indian to civilization. A scarcely less important contribution to mankind is the potato, the cultivation of which also originated with the Indians. A third important agricultural product, though less beneficial, is tobacco, the use and cultivation of which had been discovered centuries before the advent of the European.

"Architecture" may seem like a large word to apply to the dwellings of the Indians; nevertheless many of their houses were more substantial and comfortable than is generally supposed, while in the North-west many tribes reared dwellings of hewn planks, sometimes as large as 210 feet long by 30 feet wide, which were capable of accommodating several hundred individuals. More pretentious and durable were the communal houses of mud and stone reared by the pueblo people of Arizona, New Mexico, and Mexico; while farther south, in Central and South America, were edifices of hewn stone, which from their dimensions, the size of some of the blocks contained in them, and the extent and ornate character of the ornamentation, justly excite the wonder and admiration of the traveller and archæologist.

The advantages of a beast of burden had been perceived, and, though the human back furnished by far the greater part of the transportation, yet in North America the dog had been trained into an affective ally, and in the Andes the llama performed a similar office. Insignificant as was the use of the dog as a carrier, its employment cannot well be overestimated as a step in progress, when it is remembered that the plain's tribes that most employed it lived in the midst of the buffalo, — an animal which must have become of prime domestic importance in the never-to-be-enacted future of the Indian.

The need of some method of recording events and communicating ideas had been felt, and had given rise, even among the ruder tribes, to picture-writing, which in Mexico and Central America had been so far developed into ideographs, popularly called hieroglyphics, as to hint strongly at the next stage, the invention of a true phonetic alphabet. Nay, more: the Mexicans and Mayas are believed to have reached a state of true phonetic writing, where characters were made to represent not things, as true ideographic writing, but the names of things and even of abstract ideas; and this is a stage which may be said to be on the very

¹ Abstract of a lecture delivered in the National Museum, Washington, D.C., March 30, 1889, by H. W. Henshaw.

threshold of one of the proudest achievements of civilization, that of a phonetic alphabet.

Instead of living in an unorganized state, where each man was a law unto himself in all things, the Indians lived under organized forms of government, rude enough indeed when compared with the highly organized system of civilized nations, but marking an essential advance on the conditions attained by savage peoples in other parts of the world. The chieftaincy was transmitted by well-understood laws, or, as in some tribes, was more purely elective. Their social system was very ingenious and complex, and, being based largely upon kinship ties, was singularly well fitted for the state to which they had attained, of which indeed it was simply an expression and outgrowth. In many sections a considerable advance had been made in political confederation, and neighboring tribes combined for defence and to wage war against a common enemy. They had invented many and singularly efficient laws to repress and punish lawlessness against the individual and the social body, and as a consequence they enjoyed almost entire immunity from theft and many other crimes.

The development of religious ideas among our Indians is a curious and instructive study. Though the Great Spirit and the Happy Hunting Ground which missionaries and theologians thought they had discovered among them are now known to have had no existence, the Indians had by no means reached the state of culture in which they were found without developing religions. Their gods or fetiches were innumerable, their priests endowed with immense influence, and their ceremonies of devotion and propitiation were as devout as they were elaborate. The precision of the beliefs of many tribes and the elaborateness of their rituals are simply astonishing. Thus their advance in the domain of religious thought equalled, if it did not surpass, their progress in some other directions.

If by medicine we mean the rational treatment of disease, the Indian can be said to have learned only the rudiments of the healing art. Medicine, in so far as it was a distinct profession, was almost wholly in the hands of the medicine-man or shaman, who filled the twofold office of priest and doctor. Neither the theory nor the practice of the shaman had in it any thing that was rational and very little that was efficacious, except through the influence exercised over the mind of the patient; in other words, except so far as the shaman was a faith-curer. Whatever that is marvellous in the modern cases of faith-cure can be more than matched out of the practice and experience of the shaman, who learned his trade long before the European came to these shores. He who would see the Indian shaman need not seek the wilds of the Far West. He may find his counterpart on Pennsylvania Avenue. The whole medical practice of the Indian shaman was based upon the idea that all disease was the effect of evil disease-spirits that had obtained lodgement in the body, or that it was caused by witchcraft; and, so long as practice was directed to the dislodgement of these spirits, no rational treatment was possible. I am aware that the above idea of Indian medicine is contrary to popular belief, which, to some extent at least, is in harmony with the claims of alleged Indian doctors of white extraction, who claim to have derived their skill and their herbs directly from the hands of Indian experts. Recent and carefully conducted investigations on this subject, however, fully substantiate the above statements. Though roots and herbs were employed in the treatment of nearly all diseases, they were chiefly used as adjuncts to the charms and sorceries of the medicine-man. Often they were not given to the patient at all, but were taken by the medicine-man to heighten his power over the disease-spirits. Often they were applied by being rubbed on the body of the patient, or by being blown in the shape of smoke on the afflicted part.

Among the Indians was found flourishing to a remarkable degree the so-called doctrine of seals or signatures. A few examples of the doctrine derived from the eastern Cherokee by Mr. James Mooney may prove of interest. Doubtless you are all familiar with the cone-flower. The Cherokee call it deer-eye, and from its fancied resemblance to the strong-sighted eye of the deer, and its connection by name (for the Indian believes that there is a potent connection between the name of a thing and the thing itself), it is used as a wash for ailing eyes.

The common purslane (*Portulaca oleracea*) is used as a vermifuge, because the red stalk looks like a worm.

An infusion of the roots of the hoary pea (*Tephrosia virginiana*), called devil's shoe-strings in the South because of their toughness, is used by the Cherokee ball-players as a wash to strengthen their bodies, and by the women as a hair-wash to strengthen it and keep it from falling.

Who of you has ever walked in our woods without getting on his clothing the common beggar's lice (*Desmodium*)? How tenaciously they stick, you all know: so do the Cherokee; and because the burrs stick fast, they use a tea made of them to strengthen the memory. The Cherokee at least can dispense with the service of a Loissette.

You whose ambition it is to be good singers have only to drink a tea of crickets, according to the Cherokee, for does not the cricket possess a fine voice, and doth he not sing merrily?

The tendency of the human mind to speculate and to draw inferences—a tendency common alike to the savage and the civilized man—cannot be held in check forever, however strong the bonds; and just as knowledge and science escaped from priestly thrall within the history of civilized times, so a certain small amount of knowledge of the therapeutical use of drugs was gaining ground among the common folk of the Indians. It was fairly to be called old woman's practice, as it was largely in their hands. It grew out of observation. Infusions of certain herbs produced certain results, acted as emetics or purgatives, and hence these herbs came to be employed with something like an intelligent purpose. Many of the herbs used were absolutely inert; many were harmful, of course, since where there is practically no true diagnosis and no correct knowledge of the effect of drugs there can be no really intelligent selection of remedies; but in the case of certain simple diseases, herbs, the actual cautery, and, above all, the sweating process, were beginning to be recognized by the common folk as serviceable, and to be employed to some extent without recourse to the shaman.

As the child must creep ere it can walk, in such theories and treatment, childish though they may seem, may be discerned the beginnings of the noble science of medicine, which, having largely cast aside the superstitions that hampered its infant steps, now walks erect; and, although of late she seems to have revived the beliefs of her childhood, her handmaiden, science, bids her call the demon disease-spirits ignorance and vicious habits; the diseases themselves, bacilli or germs. The Indian believed that the white man carried the spirit of small-pox in bottles, and let it loose among them. Modern science actually does bottle the small-pox germs, and germinate them at will. So the Indian theory of disease reappears in a new form.

Such in briefest outline are some of the achievements of the Indian as he was found by civilized man. Whatever value may be placed upon them, whatever rank may be assigned them in the scale of human efforts, they were at least his own; and some of them compare favorably with the record of our Aryan ancestors before they split up into the numerous nations which have done so much to civilize the world. Many, I am aware, hold that the Indian had progressed as far towards civilization as his capacities admitted. Others have held, and possibly some now hold, that he was already on the decline: they see in his crude ideas and rude inventions only the degradation of a higher estate; in other words, instead of a savage preparing to enter civilization through the necessary halfway state of barbarism, he is held a half-civilized man lapsing into savagery. Such views, it is needless to say, find no favor in the mind of the evolutionist. To him the achievements of the Indian are only the mile-stones which have marked the progress of every civilized nation, in its march from what it was to what it is; to him the chief value and significance of his studies of the mental state of the Indian, as expressed in his mythology, his medicine, his social and political organization, or in his more concrete arts, is the fact that in them he reads the records of his own past. If there be any truth whatever in the theory of evolution as applied to human progress, only one inference can be drawn from the history of the Indian race as it appears in historical pages, and in the no less eloquent records interpreted by archæologists. This inference is, that, starting in its career later than some other races, or being less favored by circumstances or conditions of environment, or, pos-

sibly being less endowed, the Indian, despite all, had progressed an immense distance towards civilization; that the race contained all the capabilities for a further advance and for achieving a civilization of its own, differing, it may be, markedly from our own, as other civilizations differ, but still containing within itself all the essentials of that wonderfully complex thing called civilization. Such, at least, is the lesson evolution teaches.

Hardly had the new land been discovered when the question arose, Who are the Indians, and where did they come from? Naturally enough, the Indian had his own answers to these questions. It may almost be said, as many tribes, so many origins. A large number of tribes claim to have originated in the localities where they were first found by Europeans, where they emerged from the ground or came from the recesses of some neighboring mountain. Somewhat more poetical is the idea of the Aht of Vancouver Island, who allege that animals were first created at Cape Flattery, and from the union of these with a star that fell from the skies resulted the first men, their ancestors. Puerile these answers certainly are, yet who will maintain that they are more so than the theories of origin held by the Greeks and other classical peoples?

Who, then, are the American aborigines? For Columbus and his followers there was but one answer to the question. As he had reached the eastern shores of India, the people must be Indians, and his error is perpetuated to-day in the name. Later, when the newly discovered country was found to be not an old, but a new continent, the question of the origin and consanguinity of the Indians was renewed. So strongly tinged with religious thought was the philosophy of the day, that biblical sources were naturally first appealed to, to solve the knotty problem. As mankind was supposed to have originated in Asia, and as all but the ten lost tribes were accounted for, they were rationally appealed to for the origin of the Indian. Perhaps the best exponent of the belief in the Jewish origin of the Indians was Adair, who published his celebrated essay in 1775.

There is a theory of origin to suit the tastes of all. If you have a special bias or predilection, you have only to choose for yourself. If there be any among you who decline to find the ancestors of our Indians among the Jews, Phœnicians, Scandinavians, Irish, Welsh, Carthaginians, Egyptians, or Tatars, then you still have a choice among the Hindu, Malay, Polynesians, Chinese, or Japanese, or, indeed, among almost any other of the children of men.

Preposterous as may seem many of the theories above alluded to, nearly all of them rest upon a certain basis of fact and comparison. Many, at least, of the similarities of thought, custom, methods, arts, religions, and myths from which the theories are deduced indeed exist, though false analogies permeate them all. The thread of fact which sustains the theories is, moreover, far too slender to bear the weight put upon it. Erroneous hypotheses like the above have, however, been productive of great good in pointing out and emphasizing some of the most useful lessons which the student of anthropology of the present day must learn and ever keep in mind. Of these, perhaps the most important is that the human mind is everywhere practically the same; that in a similar state of culture, man, in groping his way along, will ever seek the same or similar means to a desired end; that, granting the same conditions of environment, man acts upon them, and is acted upon by them, in the same way the world over: hence in large part arise those similarities of customs, beliefs, religions, and arts, which have been appealed to as evidences of genetic connection or of common origin, when in fact they are evidences of nothing but of a common humanity.

Likewise up to the present time the attempts to classify mankind by his physical characters have produced discordant results, and little dependence is to be placed upon the results themselves or upon the theories arising therefrom which relate to the more profound question of the origin of races. In turning to the test of language, if doubt and uncertainty were left behind, and harmony and agreement took the place of discordant views, we might count ourselves fortunate indeed. Yet, though still in its infancy as regards future possibilities, and while it needs and welcomes the aid of all the other sciences to solve the complex questions which come properly within its domain, it is unquestionably our best guide in prob-

lems relating to the origin and relationship of the races of mankind.

The evolution theory sees evidences of growth and development in every language spoken by man. Comparing the languages of highly civilized peoples with those of lower culture, it finds in the latter evidences of the successive stages through which all languages have necessarily passed in their upward growth. It notes the fact that among lower peoples languages are less and less highly organized, and that among them signs are much more freely used than among the higher; that the sign-language is capable of a development among savage peoples and mutes so wonderful as to be the medium of all classes of ideas; and, noting these, it is prepared to believe, though it has not yet proved, that there was a time in the dawn of the human race when organized vocal speech was unknown, and when the fingers, the facial expression, and the postures of the body, were the chief if not the sole means possessed by man to communicate to his fellows his simple wants and ideas.

Before proceeding further, let us glance briefly at some of the methods employed by linguistic students in their efforts to unlock the mysteries of linguistic relationship. How the comparative study of language is to be carried on, linguistic students are well agreed. Since language is made up of words, each word being the sign of a thought, the science of linguistics is largely the study of words: in other words, it is the tracing word genealogies by means of their etymology. By stripping words of the accretions they have received in the process of time, they may be resolved into roots; and by the comparison of these roots the philologist obtains proof of relationship, and classifies languages into linguistic families.

It may be well at this point to define clearly what linguists mean by a linguistic family. A linguistic family is a group of languages which have sprung from a common parent language. The first requisite of a linguistic family, therefore, is that the languages composing it shall be related genetically; the second, that they shall not be related to the languages of any other family. Each family thus consists of a group of languages wholly disconnected from all other families. The chief danger to the student in dealing with such material is to mistake apparent for real resemblances, and to be led to present false word analogies as evidences of true genetic relationship.

That linguistic science is competent to deal with problems of great magnitude and intricacy, and that there are students who are capable of applying its varied resources, best appears in the grand achievements which concern the group of languages known as the Aryan or Indo-European family, in which our own English tongue takes a prominent if not the first place. It is almost wholly as the result of linguistic studies that the component members of the large and important Aryan family are now recognized, and the history of its earlier members reconstructed to a remarkable degree. The family contains eight groups of distinct languages. Among many others, the family includes as offspring from one source Sanscrit, Hindu, Romany or Gypsy, Persian, Armenian, Welsh, Cornish, Irish, Scotch, Latin, Italian, French, Spanish, Portuguese, Albanian, Greek, Bulgarian, Russian, Servian, Polish, German, English, Dutch, Swedish, Danish, Norwegian, and many others. Though one of the largest, and, by reason of its history and the prominent part it has played in the civilization of the world, the most important, the Aryan family is only one of many linguistic families, each one of which is made up in the same way of a greater or less number of related languages. Such are the Bushman and Hottentot of Africa, the Semitic of Asia and Africa, the Chinese, Australian, and many others. The related languages which make up linguistic families vary indefinitely in the amount of likeness they bear to each other. They are often so much unlike, that those who speak them cannot understand each other; as, for instance, English, German, and French. Though these languages are mutually unintelligible, yet they contain many words of nearly identical form, while other members of the Aryan family have in process of time become so unlike affiliated tongues that it requires the most critical study to detect their relationship. As languages are the principal divisions of a linguistic family, so dialects are the subordinate divisions of a language. Family, lan-

guages, and dialects are to linguistic science what family, genera, and species are to biology.

There is an important question which may be considered at this point: To what extent is linguistic relationship to be interpreted as blood relationship; in other words, how far does linguistic classification answer for race classification? In cosmopolitan America, where nearly all speak English, and yet a very large proportion are of foreign parentage, it is obvious that a pure linguistic classification of individuals would largely misinterpret the facts of parentage and race. Nevertheless, taken in connection with readily ascertained facts, it will not mislead even in such an extreme case, and usually a language classification of a tribe or people actually does express race relationship.

To return to the Aryan family. Not only are we able by means of language to class together as related members of one great family the above-mentioned languages, which apparently are so diverse in the sound and form of their words, but by means of word analysis we can reconstruct the past history of the peoples who spoke them, and can get a glimpse even of the mode of life, customs, arts, and religious beliefs of our remote Aryan ancestry. The process by which this is done is sufficiently simple, although, like many other simple processes, its application is not so easy. When we find in the greater number of the languages of a linguistic family the same fully formed word with the same meaning, we are justified in believing that it existed before the separation of the family, and that the thing it signifies was already known to the parent body. Applying the rule to the case of the Aryan family, we learn, that, contrary to earlier theories, our forefathers came from a cold region, since eastern and western Aryan tongues contain names for the birch and pine, and these are the only two tree names common to both branches. The same process continued shows us that the family relations were defined much as they are with us to-day, and that marriages were monogamous. The old Aryans held the land in common, and redistributed it from time to time among the members of the clan. The houses were built of wood, and were entered by means of a door. The communities were settled in villages with a recognized chief or head, and the villages were connected by roads over which travelled peddlers carrying their wares for sale. All were free men. They worshipped natural objects and natural phenomena, more particularly the sun. They believed in the evil spirits of night and darkness. They were a pastoral people, and cattle and sheep formed their chief wealth. They also had goats, pigs, dogs, geese, and bees. They had domesticated the horse, though they did not ride, but employed him, like the ox, for drawing carts. They still used stone implements, though gold and silver and bronze were known. Charms were chiefly relied upon to cure disease. Future events were divined from the flight of birds. These are a few of the facts among many which linguistic science has revealed to us pertaining to the life and achievements of our Aryan ancestry before the historic period. Surely no contemptible record this for a new science.

Let us now turn our attention to the Indian languages of this country, and see what progress has been made in the attempt to classify them. It may be premised that no part of the known world affords a better opportunity for the study of the nature of language and its processes of growth than America. The Indian languages are by no means the most primitive at present spoken by man; and it may surprise some of my hearers to be told that in respect of some of their characteristics they compare favorably with Greek and other classic tongues, though the classic languages as a whole belong to a much higher stage of development. Instead of being mere jargons of words, disconnected with each other and capable of expressing only the simplest ideas, as I find many intelligent people believe, they are in some directions singularly highly developed; and not only are they capable of serving as the vehicle of every thought possible to their possessors, but their vocabularies are extensive, possess many synonyms, and furnish the means of discriminating the nicest shades of meaning.

As a body they are still in that stage of development in which the various processes of language-making may be studied with comparative ease. Just as the various natural processes by which mountains are levelled and the earth's surface carved out and re-

modelled are more apparent, and more readily studied by the geologist, in the still primitive West, so Indian languages offer to the scrutiny of the linguistic student a similar unfinished condition highly favorable for analysis and study.

For the past fifteen years Major Powell and his assistants of the Bureau of Ethnology, with the aid of many collaborators in various parts of the country, have been accumulating vocabularies by means of which to classify Indian languages. The present provisional results of the study of the large amount of material accumulated show that in the territory north of Mexico there were at the time of the discovery fifty-eight distinct Indian linguistic families, containing some 300 or more languages and dialects.

So far as Language is a competent witness, she has exhausted all the evidence thus far accumulated when she has grouped the Indians in fifty-eight families. Back of this point she may not now go, except as a theorist and in pure speculation. So far as she is entitled to speak authoritatively, these fifty-eight families are separate entities, which never had any connection with each other. But she recognizes her own limitations too well to dare to state positively that this is the interpretation that must be placed upon the results she has attained. When facts from which to draw deductions fail, men may and do resort to theories. Let us glance at the two broad hypotheses which have been based upon the development theory of language. The first is in effect that all the present languages of the earth are not so unlike that they may not have been developed from a single original parent language. By this view the original language is supposed to have changed and developed into all the various forms of speech that are now spoken or that have ever been spoken. According to this view, the families of languages as at present classified have no other significance than as groups of related tongues, the once existing connection of which with other tongues cannot now be proved, because through the process of change the connecting links have been lost.

The second hypothesis assumes that there must have been at least as many original languages as there are now existing families: it assumes, in other words, that the families of speech are fundamentally distinct, and therefore cannot have had a common origin. The first theory postulates that from original unity of language has come infinite diversity; the second, that the tendency has ever been from original diversity towards unity.

Widely different as are these two theories of the origin of linguistic families, they agree in one essential particular: they both remove the origin so far back in time as to make it practically impossible to prove the truth or falsity of either theory. Both of these hypotheses have able advocates; but for a variety of reasons, which time will not permit me to give, the second is deemed the more plausible. At all events, it best explains many difficulties.

There is abundance of archæologic evidence showing that man has resided on this continent for a very long period; and the character of the remains prove that the farther back in time we go, the ruder being he was. Linguistic testimony is to the same effect; and there is no *a priori* reason why man may not have lived upon this continent ages before he learned to talk, — no reason, for that matter, why America may not have peopled the earth, if the earth was peopled from a single centre, or why, if there have been several centres of origin for mankind, the Indians, as they themselves believe, may not have originated here where they were found.

Obviously the fifty-eight families are as likely to have originated here as anywhere else; for remember that every country has linguistic families of its own to account for. Is there, then, any possible theory which will meet the case? There is certainly one that is possible, if not probable. It is the theory, that, whether born from the soil or an emigrant from other lands, our Indians spread over the entire continent before they acquired organized language, and that from not one but from fifty-eight centres sprung up the germs of speech which have resulted in the different families of language. This theory accords with the idea that there may have been but one origin of man, and that in any event all the Indians from the Arctic to Patagonia are of one race. It does not forbid the supposition that the Indian was an emigrant from other shores, though it permits the thought that the American Indian may have originated on American soil.

Though this theory seems more probable than the other, which assumes that the languages of our Indians were brought here from foreign shores, it must be frankly admitted that Linguistic Science is not now, and possibly never will be, competent to decide between them. If she is unable to decide fully as to the origin of the Indian's language, how can she be expected to solve the infinitely more complex problem which concerns the ultimate origin of the peoples who spoke them? She certainly has no solution for this problem now. When she considers the number of linguistic families, and the vast length of time it must have taken to develop their languages and dialects, she finds herself confronted by a problem beyond her present powers. And yet the case is not hopeless. Linguistic Science is still in her infancy, and her future may contain possibilities far exceeding the dream of the most sanguine.

When interrogated as to the origin of the Indian, all that she can now say is, that whether the Indian originated on this continent, where he was found, or elsewhere, it was in bygone ages, — ages so far removed from our own time that the interval is to be reckoned, not by the years of chronology, but by the epochs of geologic time. With such problems she affirms that at present she cannot deal.

I have presented the subject to you to-day, not to answer it, but to aid you in comprehending the tremendous difficulties that enshroud the problem. Much time and ingenuity have been expended in the past in attempting to force an answer to a question which cannot even yet be answered. The question, however, that really concerns the ethnologist of to-day is not *who* are the American Indians, but *what* are they, and what have they accomplished in working out the problems of life, which, ever since his birth, man has grappled with.

In reading the history of mankind, we are too apt to be blinded by the achievements of our own Aryan race. As the old Greeks classed as barbarians all who did not speak their own tongue, so we are prone to think that most of the good that has come to humanity has come through and by means of our race. In truth, there are valuable lessons to be learned from races less high in civilization than our own. Though many and diverse are the roads that lead man to the higher life, they all pursue about the same course, and time only is required to unite them into one broad stream of progress.

Many are the lessons taught by anthropology; but the grandest of them all is the lesson of the unity of mankind, — the unity of a common nature and a common destiny, if not of a common origin.

NOTES AND NEWS.

WE hear that the Russification of the German educational establishments in the Baltic provinces goes on apace. The University of Dorpat, in particular, is suffering in this respect. Recently the Czar specially sanctioned the Russianizing of the faculty of law within the next few years, and now it is intended to transfer the theological faculty from that seat of learning and enlightenment to Moscow or St. Petersburg, in order to deprive it entirely of its German-Protestant character. German culture evidently seems a dangerous element in the eyes of the Russian Government.

— *Nature* states that Herr Victor Apfelbeck, the entomologist, will shortly start, in behalf of the Bosnian Government, on a journey of research in Herzegovina. Last year he discovered in southern Bosnia five new species of eyeless cave beetles, and his investigations excited much interest among entomologists.

— The largest tree in Great Britain, and one of the most famous, is the Cowthorpe oak in Yorkshire, which is believed to be some fifteen hundred years old. When Evelyn wrote his "Sylva," in the seventeenth century, its circumference at the ground was seventy-eight feet; but later, earth was banked up around it, which covered some considerable projections, and reduced its girth. As told in *Garden and Forest*, at the beginning of the last century its branches overshadowed an area of half an acre of ground. The top or leading branch fell at some unrecorded date, curiously slipping down into the hollow trunk, where it remained. In the last century one of the main branches which was blown down proved to be ninety feet in length, and yielded five tons of timber. When

carefully measured by Dr. Jessop in 1829, the girth of the tree at the ground was sixty feet, and at a yard above, forty-five feet; the chief remaining limb was fifty feet long and its circumference eight feet, and the height of the tree was forty-five feet. It was then hollow to the top. For many years saplings raised from this tree were sold in pots by the villagers for as much as a guinea apiece. It is now a venerable ruin, but most picturesque in its decay. It stands in a green paddock, carefully protected from injury, with its ancient limbs supported by props. An idea of its size may be gathered from the statement that at least forty persons can stand within its cavity, and that its circumference is greater than that of the Eddystone Lighthouse, which was confessedly designed on the model of an oak.

— Does the cuckoo ever hatch its own eggs? Herr Adolf Müller answers this question in the affirmative, and has given in the *Gartenlaube* a full account of a case which he himself claims to have observed. A translation of this account has appeared in the *Ibis*, and is reproduced in the new number of the *Zoölogist*. The latter periodical prints also a translation of an article in which Herr Adolf Walter disputes the statements of Dr. Müller, who, he thinks, must have made a mistake. The same subject is dealt with in the June number of the *Selborne Magazine* by Mr. C. Roberts, who quotes from "Zoonomia" an interesting passage, in which Dr. Erasmus Darwin expresses his belief that the cuckoo sometimes makes a nest and hatches its own young. In this passage Dr. Darwin gives an extract from a letter of the Rev. Mr. Wilmot of Morley, near Derby, describing an instance brought to Mr. Wilmot's notice in July, 1792, by one of his laborers, and afterwards closely watched by Mr. Wilmot himself. Mr. Wilmot was confident that the bird was a cuckoo.

— There is a note by Dr. Charles Waldstein in the London *Athenæum* of June 8 which will no doubt attract much attention. Dr. Waldstein states that recently, while in Constantinople, he was shown photographs by Hamdy Bey of the sarcophagi discovered some time since at Sidon; and he is of opinion that the discovery is one of the most important made in this century, and, moreover, that excepting the Elgin marbles, and the Hermes of Praxiteles at Olympia, "no works of ancient Greek art have been found of greater artistic interest and merit." One of the sarcophagi contains a portrait of Alexander. Hamdy Bey does not positively assert that this is the tomb of Alexander, but Dr. Waldstein thinks he will be justified in pointing to the possibility of such being the case.

— At the New York meeting of the American Institute of Mining Engineers, February, 1889, Mr. John C. Smock of Albany, N.Y., read a paper on "The Iron-Mining Industry of New York for the Past Decade," from which it appears that the total product of the iron-mines of the State in 1888 was 1,207,000 tons. This sum includes all the returns received from the mining companies and carefully made estimates for three mines unreported. According to the "Ninth Census," New York produced 14 per cent of the iron ore mined in the country. Ten years later, the State produced 1,262,127 tons, or 15.4 per cent, and ranked third in the list of States. In 1886 the production of all the iron-mines in the country, as estimated by James M. Swank, general manager of the American Iron and Steel Association, was 10,000,000 tons. In 1887, according to the same authority, it amounted to 11,300,000 tons. New York mines produced in the former year about 900,000 tons, and 1,100,000 nearly in the latter year, or 10 per cent of the whole. In 1888 the same average proportion was maintained, but the rank changed to fourth, falling behind Michigan, Pennsylvania, and Wisconsin. According to the last report of the American Iron and Steel Association, the total for the United States in 1888 was 12,050,000 gross tons. The fluctuation in the totals for the State during the decade have not been so great as might be inferred from the sharp fluctuations in the prices for pig-iron; and the steadiness in the figures for 1886, 1887, and 1888 is remarkable proof of the enduring capacity of the mines of the State. The variation from year to year is not as great as it is in the magnetic iron-ore districts of New Jersey. The production of the iron-mines in New Jersey in 1880 was 745,000 tons. In 1885 it had fallen to 330,000 tons, and in 1887 had risen to 547,000.

Another notable fact brought out in this comparison is the diminished number of mines producing these totals. At the commencement of the decade there were about 100 mines at work: last year, only 50 were producing ore.

— A recent issue of the French *Journal Officiel* contains the report of the consultative committee for sea-fisheries in France, on the subject of poisoning through the eating of mussels. The committee, in the first place, recognize that the oysters which cause poisoning are those which have become stale, or have been kept in water rendered foul by decomposed organic matter, and question whether the same may not be the case with regard to mussels. Various explanations of mussel-poisoning were made to the committee. By some it was attributed to a parasite crab (*Pinnotheres pisum*). This explanation, however, was unsatisfactory, for in the United States this *Pinnotheres* is sought after as food. By others the presence of the poison was attributed to the spawn of star-fish, and also to copper absorbed from wrecks. Both these suggestions were, however, disproved. The theory of Orfila, also, that the poisonous action of the mussels in the stomach is the result of imagination, does not find acceptance at the hands of the committee. An authority on the subject has found that the mussels lose their poisonous property if cooked for a period of ten minutes with carbonate of soda. The committee conclude that the poisonous nature of the mussels is due to the presence in them, especially in the liver, of a volatile organic alkaloid (*mytilotoxine de Brieger*), developed under the influence of a particular microbe which is only found in mussels living in stagnant and polluted waters. Finally, they advocate the removal of all restrictions on mussels in artificial beds, and recommend the sale at all times, at fish-markets, of mussels coming from such beds, which are usually situated in favorable localities, — a sale which is at present prohibited in France during May and June.

— There is being exerted at this time an effort for the establishment in the University of Pennsylvania of a department of pedagogics. The university being without the necessary funds for this work, two of this year's graduating class, as we learn from *The Philadelphia Telegraph*, have undertaken the raising of ten thousand dollars, which will provide for a three-years' salary for a pedagogic professor, and found a library; and at the expiration of three years it is believed that the department will be self-sustaining. A short time ago Superintendent MacAlister of the Board of Education addressed a letter to Dr. William Pepper, provost of the university, in which he set forth the manifest urgency and value of such a department. He said, "Until within a few years American students were compelled to go abroad for the purpose of pursuing their studies in this branch, and large numbers still find it advantageous to avail themselves of opportunities which are but scantily provided in this country. The German universities have long maintained chairs of pedagogy. In the year 1876 a chair of education was organized in the University of Edinburgh, and has since been occupied by a distinguished scholar, Professor Laurie, who has exerted great influence over the education of Scotland. Some years ago, lectures on education were given for the first time in the Universities of Oxford and Cambridge, and in both of these schools lectures are now read regularly by men eminent as teachers. The first chair of pedagogy in the United States was organized in 1879, in the University of Michigan, and this was followed by the establishment of professorships in the Universities of Wisconsin, Iowa, Cornell, and other less important schools. The only serious attempt thus far made to furnish opportunity for the study of pedagogy in the older States was the work done by Professor G. Stanley Hall before his retirement from Johns Hopkins; and it is understood that this department will be recognized in the new Clarke University in Massachusetts, of which Dr. Hall has been appointed president. It is only a question of time when all the great schools in the Eastern and Middle States will be moving in this direction." Professor MacAlister remarks, that, if the great function of a university is to teach and supply the world with teachers, it cannot be said to fully perform its office if it does not provide adequate professional preparations for the teacher's work beyond the studies of the academic curriculum. He holds that in a department of pedagogy the instruction should consist of the following courses: his-

tory of education, psychology and its relation to education, the science and art of teaching, organization and administration of school systems, school hygiene. He adds, "With the provisions already existing in the university, the organization of such a department could be easily secured, and the financial responsibility incurred would be very slight. A chair of the history and science of education would be sufficient to begin with. The chair of psychology, recently organized, the chair of philosophy, the chair of political economy, the chair of hygiene, could be made available in furnishing the additional courses required. The general course in pedagogy would probably not extend beyond one year, but special courses could be formed for those desirous of more extended study. To give the department academic dignity, and make it really valuable, a degree should be granted. The degree of Ph.D. is suggested, which might be given on examination in the courses in pedagogy, with such additional electives — say, three or four — in language, literature, science, or history as might be prescribed. In this way the department of pedagogy would become affiliated with the general instruction of the university, and would also fall into place among the university courses created during the present academic year."

— No other ancient works of the United States have become so widely known, or have excited so much interest, as those of Ohio. This is due in part to their remarkable character, but in a much greater degree to the "Ancient Monuments of the Mississippi Valley," by Messrs. Squier and Davis, in which these monuments are described and figured. The constantly recurring question, "Who constructed these works?" has brought before the public a number of widely different theories, though the one which has been most generally accepted is that they originated with a people long since extinct or driven from the country, who had attained a culture status much in advance of that reached by the aborigines inhabiting the country at the time of its discovery by Europeans. The opinion advanced in a paper by Cyrus Thomas, on "The Problem of the Ohio Mounds," published by the Bureau of Ethnology, in support of which evidence is presented, is that the ancient works of the State are due to Indians of several different tribes, and that some, at least, of the typical works, were built by the ancestors of the modern Cherokees. The discussion is limited chiefly to the latter proposition, as the limits of the paper do not permit a full presentation of all the data which might be brought forward in support of the theory, and the line of argument is substantially as follows: First, A brief statement of the reasons for believing that the Indians were the authors of all the ancient monuments of the Mississippi valley and Gulf States: consequently the Ohio mounds must have been built by Indians. Second, Evidence that the Cherokees were mound-builders after reaching their historic seats in East Tennessee and western North Carolina. This and the preceding positions are strengthened by the introduction of evidence showing that the Shawnees were the authors of a certain type of stone graves, and of mounds and other works connected therewith. Third, A tracing of the Cherokees, by the mound testimony and by tradition, back to Ohio. Fourth, Reasons for believing that the Cherokees were the Tallegwi of tradition, and the authors of some of the typical works of Ohio.

— The *Glasgow Herald* states that last year, while some workmen were engaged in drainage operations at Lochavullin for the purpose of forming a public park, they discovered what was believed to be an old "crannog," or lake-dwelling; and several experts who visited it were of opinion that it was a very good specimen of an ancient lake-dwelling. Arrangements were made by the town council for its being properly investigated and preserved as far as possible, but the weather has rendered operations impracticable till within the last few days. Workmen are now engaged in excavating round the place; and recently it was visited by Mr. Cochran-Patrick, under-secretary for Scotland, and other gentlemen interested. Among the articles turned up by the workmen during the examination were a stone bullet, such as would have been used in the slings of the period to which the dwelling is supposed to have belonged, and portions of the wattle used in the construction of the dwelling. Professor Hedley of St. Andrews took some photographs of the place.

— The last international medical congress, which met in Washington in 1887, unanimously selected Berlin as the next place of meeting in 1890. Professors Virchow, Von Bergmann, and Waldeyer, to whom was confided the preliminary direction of the next congress, have already taken active steps to make it a success. All the medical faculties and other medical bodies in Germany have been invited to nominate delegates to confer together on the subject this year, at the time of the Heidelberg meeting of the German Scientific Association in September. It is proposed that the congress of 1890 should commence its proceedings on Aug. 6, 1890.

— Dr. Oliver P. Jenkins, professor of biology in DePauw University, accompanied by Oscar Vaught and G. C. Price, two of his students, sailed June 29 from San Francisco for the Hawaiian Islands, on a scientific fishing expedition. They go under the authority and with an appropriation of the university for that purpose. They will return the middle of September. They hope to find a valuable field.

— Krüss and Schmidt's statement that both nickel and cobalt contain a small percentage of a hitherto unknown element, gnomium, amounting in the case of one specimen of nickel to as much as 2 per cent (*Ber. der deut. chem. Gesellsch.*, xxii. 11; *Nature*, xxxix. p. 325), has not been permitted to pass unchallenged, and quite recently two papers have appeared which tend to show that the supposed new element is non-existent. At the time when they were led to recognize the presence of this common impurity, says *Nature*, Krüss and Schmidt were engaged in repeating Winkler's old determination of the atomic weights of nickel and cobalt, in which the ratio Au : Ni or Au : Co was arrived at from the amount of gold precipitated by these metals from neutral solutions of gold chloride. Winkler, in the mean time, has repeated this work with carefully purified materials (*Ber. der deut. chem. Gesellsch.*, xxii. 890), and has not only failed to obtain any evidence of the existence of gnomium, but, moreover, calls in question the purity of the metallic specimens employed by Krüss and Schmidt. A communication from Dr. Fleitmann to the *Chemiker Zeitung* (xiii. 757) lends considerable support to this view. Adopting the method patented by Krüss and Schmidt for separating this common impurity from nickel and cobalt by extracting the hydroxides of these metals with sodium hydroxide, Fleitmann has examined a number of specimens of commercially pure nickel and cobalt, and, so far from obtaining 2 per cent of gnomium oxide, has failed to isolate from 50 grams of material a weighable amount of any impurity which would serve to justify the view that a hitherto unknown element was associated with these metals. Fleitmann points out that when the hydroxides of commercially pure nickel and cobalt are treated with large quantities of sodium hydroxide, impurities go into solution which vary in composition and amount with the source and degree of purity of the metals. These impurities consist of small quantities of the oxides of lead, zinc, arsenic, manganese, molybdenum, silicium, aluminium, cerium, chromium, etc., together with an amount of nickel or cobalt oxide not exceeding $\frac{1}{100}$ of one per cent of the hydroxide extracted, and, when separated from the alkaline solution by the addition of an acid and subsequent precipitation with ammonium carbonate, give rise to a highly complex mixture of oxides and acids which can only be separated and identified with considerable difficulty. It is not improbable, therefore, that Krüss and Schmidt have been dealing with some of the constituents of this mixture, and that, on further examination, gnomium oxide will prove to be a mixture of the oxides of elements already known.

— At the ladies' conversazione of the London Royal Society, June 19, there were exhibited by Mr. Percy E. Newberry, by kind permission of the director of the Royal Gardens, Kew, a series of ancient funeral wreaths and plant-remains, discovered last year by Mr. W. M. Flinders Petrie, in the cemetery of Hawara, Egypt. As described in *Nature*, these consisted of wreaths of Egyptian and Greek manufacture, which were all made in the first century B.C., and were found in wooden coffins, either resting on the heads or surrounding the bodies of the mummies. Among them the following are of special interest: — (1) A very perfect wreath

composed of the flower-heads of a species of immortelle (*Gnaphalium luteoalbum*, L.), called by the ancients "helichrysos," and much used by them in making garlands. Helichrysos wreaths are mentioned by Pliny (*Hist. Nat.*, xxi. 96) as having been used in Egypt in Ptolemaic times, also by Theophrastus, Athenæus, Cratinus, etc. (2) Portion of a curious garland made of cones of papyrus pith, lychnis and rose flowers, rose petals, and scarlet berries of the woody nightshade. These latter are mentioned by Pliny as having been employed in garland-making by the Egyptians. (3) Portion of a wreath of Greek manufacture made of flowers of the *Polyanthus narcissus* (*N. Tazetta*, L.). Wreaths made of this flower, the "clustered narcissus" of the ancients, are often mentioned by early Greek poets. (4) Portion of a wreath made of the flowers of a species of rose (*Rosa sancta*, Richards). (5) A perfect wreath composed of rose-petals threaded by a needle on to strips of twine. "Recently," writes Pliny in his history of garlands, "the rose chaplet has been adopted, and luxury has now arisen to such a pitch that rose garlands are held in no esteem at all if they do not consist entirely of petals sewn together with the needle" (*Hist. Nat.*, xxi. 8). There are also exhibited (6) a portion of a wreath composed of twigs of sweet marjoram (*Origanum majorana*, L.), lychnis flowers, coils of papyrus pith, and pieces of copper tinsel; (7) a portion of a wreath composed of chrysanthemum flowers and leaves, purple cornflowers, and petals of the flower of a species of *Hibiscus*; (8) a portion of a wreath made of flowers of *Matthiola liberator*, L., flowers of the polyanthus, narcissus, and *Hibiscus* petals; (9) portions of two necklaces made of flowers of the date palm threaded on strips of twine; and (10) a fragment of a necklace made of fruits of the date palm. Among the plant-remains are peach-stones, dates, and date-stones, walnut-shells, currants, pomegranates, plums, figs, chick peas, common garden beans and peas, lentils, wheat, barley, and oats. These are probably the remains of the ancient funeral feasts which were held in the Hawara cemetery by the relatives of the deceased people who were buried there. The whole collection (of which the series exhibited is only the third part) is fully described by Mr. Percy E. Newberry in Mr. Flinders Petrie's "Hawara, Biahmu, and Arsinoë."

— *Nature* announces the death of Signor G. Cacciatore, director of the Palermo Observatory. He died on June 16, in his seventy-sixth year.

— In response to demand, a new edition of Professor A. Gray's small work on "Absolute Measurements in Electricity and Magnetism" will be issued immediately by Messrs. Macmillan & Co. The whole work has been very carefully revised, and several alterations and additions made, which it is hoped will bring it into accordance with the present state of practical electricity, and render it still more useful to students and electrical engineers. The preparation of the second volume of the same author's larger treatise on the same subject is being pushed on at the same time as quickly as possible.

— Years ago, when Mr. Charles Wickes was engaged in the preparation of his work on "Spires and Towers of Mediæval English Churches," he had the good fortune and good sense to consult certain members of the architectural profession, who earnestly besought him to print, before the completion and issue of the more elaborate colored drawings, an uncolored edition of his work for the special use of architects. This work Messrs. Ticknor & Co. have reprinted, and are about to issue, not in its original form of three volumes, but the entire work in a single volume. A certain portion of these plates have already been republished in the imperial edition of the *American Architect*; but even subscribers to that edition will probably be glad to find a place for the work in its enlarged and completed form, as the plates which have been printed in the imperial edition of the *American Architect* are scattered through the issues of that journal during a period of nearly two years, and therefore are not readily accessible. Moreover, the present edition contains in full the valuable notes and criticisms of the original, making forty pages of text and notes, not less valuable than the plates. The work is now in press, and will be ready for sale in the course of a few weeks.

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A MOVEMENT IS ON FOOT to celebrate the four-hundredth anniversary of the discovery of America by a world's exhibition to be held in this city. The time before 1892 is considered short for the satisfactory organization of such a vast undertaking; but, as the suggestion meets with general approval, it is likely to be carried forward to success. As to the location to be chosen, considerable discussion has begun, many opposing a proposal that the buildings should be erected in Central Park. This opposition argues, and as it appears justly, that the use of the park for such a purpose would interfere with its legitimate use as a pleasure-ground for at least a year, and that the injuries inflicted on the grounds could not be effaced in ten years. Some spot farther up on the island is more likely to be chosen,—a spot which, with the means of rapid transit which already exist, and which could be added to without much outlay, would be of easy access. We look forward to a rapid and satisfactory development of the plans for the exhibition; although, of course, as Americans do not seek any but a home market for their goods, the main stimulus of such a fair is not so strong as with Europeans.

ON JULY 9 the President appointed Professor T. C. Mendenhall superintendent of the Coast and Geodetic Survey. Professor Mendenhall was born in Ohio in 1841. From 1873 to 1878 he was professor of physics at the Ohio State University at Columbus. In

1878 he went to Japan, where he organized a physical department in the University at Tokio, as well as a weather bureau for the country. On his return to this country, in 1881, he again assumed the chair at Columbus, and in 1882 started the Ohio Weather Bureau. In 1884, Professor Mendenhall was called to Washington to take charge of an electrical branch of the Signal Office, and during his stay in the government employ also busied himself in developing a system of earthquake observations in the United States. Since 1886 he has been president of the Rose Polytechnic School at Terre Haute, Ind. In the new work Professor Mendenhall has undertaken, his many friends will wish him all success.

The last Congress legislated Mr. F. M. Thorn, the late superintendent of the Coast Survey, out of office at the close of the fiscal year. It provided, in an appropriation bill, that he should be appointed by the President, "by and with the advice and consent of the Senate." The proposed change of the law was submitted to Mr. Thorn by the Senate sub-committee on appropriations, and his opinion was requested as to the advisability of its enactment. He replied that he regarded as entirely unobjectionable the requirement that the superintendent should be appointed "by and with the advice and consent of the Senate," and that he had no personal interest in it whatever. His resignation was written on March 6, but was withheld at the suggestion of Senator Allison until April, when it was sent to the President. On June 22 Mr. Thorn directed the attention of the President and Secretary Windom to the law requiring the appointment of a superintendent to be made at the beginning of the fiscal year. He has not since discharged any of the duties of the office. Although Mr. Thorn was not a scientific man, like all of his predecessors, yet it is believed, that, as a result of his excellent executive ability, the forces of the office have been so employed during the past four years as to greatly increase their efficiency.

MASTER AND WORKMEN.

THE greatest interest attaching to the Petit-Bourg Works, for the manufacture of light railway material, twenty miles from Paris, is to be found in the relations that exist between the master and workmen. As described in *Engineering*, a system of almost military discipline prevails everywhere. With the exception of a small number of hands, all work is paid for by the piece, and every thing that fails to pass a rigid inspection is condemned at the expense of the men. The hours of the work are long,—fourteen hours a day,—and Sunday is only observed as a holiday after two o'clock. Yet the men are contented and prosperous, and are the first to stifle and exclude the spirit of discord which too often prevails in the factories of adjoining communes. Workmen are always eager to obtain service at Petit-Bourg, and, once there, are loth to quit it. The secret lies in the fact that the men like to be governed, and that their material welfare is always carefully studied. Comfortably fitted up dwellings are provided for the unmarried men, in which they can rent a well-furnished bedroom for 1½ pence a day, or for 2½ pence if two live together. Then a clean and attractive restaurant is close at hand, where well-cooked meals are furnished at prices just sufficient to pay expenses. Married men are not allowed to use this restaurant, but they can purchase and take home with them their meals at a somewhat lower price, so that all the expense and trouble of cooking is saved them. In this restaurant a separate room is provided for the use of the foremen, the scale of charges being the same; and a general shop is attached, where every thing can be purchased at the lowest possible rate. For those men who wish to save the expense and trouble of going to the restaurant at meal-times, a range of ovens is provided within the works, and placed under the charge of a superannuated employee, whose duty it is to receive the food brought by the men, and have it comfortably prepared when the breakfast or dinner hour comes. The men are paid monthly, and are allowed to open credits to fixed amounts with the restaurant and shop, the balance due to them being paid at each settlement. Pay-day is celebrated

by the works being closed for three days, during which time the men have absolute license to get drunk if they feel so disposed, the fact being that about one per cent avail themselves of this privilege. Drunkenness at another time is followed by dismissal. The married workmen are provided with comfortable cottages surrounded by gardens, and with rents varying from six to twelve francs a month, according to their size and location. A bonus is secured to them on each addition to their family, in the shape of a monthly reduction in their rent; and long service also secures a further reduction. By this arrangement the cottages gradually fall into the absolute ownership of the workmen, and a most powerful inducement for steadiness and content is thus secured. The single men are also allowed to have a plot of garden if they desire it, and this is found to be a great attraction in taking and keeping service under M. Decauville. The result of this wise administration is seen in the fact that the Petit-Bourg colony possess savings to the extent of 200,000 francs, which are not invested in savings banks, but in the works themselves, where it receives a guaranteed interest at six per cent. Workmen are insured against all accidents by M. Decauville, who encourages and assists the several benefit societies, which are mainly supported by the workmen themselves. But the glory of Petit-Bourg is its theatre, — a substantial and really elegant building, 100 feet long and 39 feet wide, capable of seating about 500 persons. This theatre is nicely fitted up, and has a capacious stage, with appointments that would do credit to many a provincial town. Here about four performances are given a year, not by third-rate actors representing sensational drama, but, when it is determined that a performance shall take place, subscriptions are raised among the employers, the foremen, and the men, a committee is formed to negotiate with some good Paris company, and every thing is arranged admirably. It may be mentioned, in passing, that the "Maitre des Forges" is a never-failing favorite. But, besides theatrical performances, the theatre at Petit-Bourg serves other purposes: it is the gathering-place on all political occasions, at which, needless to say, M. Decauville presides in his capacity as Monsieur le Maire; it is the scene of numerous concerts given by the Petit-Bourg band, formed exclusively of Decauville workmen; the corps of Sapeurs-Pompiers, also from the works, hold their meetings and celebrations here; and in the theatre M. le Maire distributes prizes gained in the schools which he controls.

Altogether the Petit-Bourg colony leads a happy and prosperous, though a laborious life; and if M. Decauville can succeed in the future, as he has done in the past, in saving the district where he and his family have ruled for so many generations from the contagion of discontent and communism, Petit-Bourg will continue in its prosperity, and its hard-working population will remain contented.

THE TRANSMISSION OF ENERGY BY COMPRESSED AIR.

WE have not before us any data to show the actual development of the Compagnie Parisienne de l'Air Comprimé, but a statement of the number of installations in active work towards the close of last year will serve to give an idea of the number and variety of industries which have availed themselves of this means of obtaining motive power. Since then, the number of subscribers has largely increased, and one section of the great public lighting scheme of Paris has been carried out by the company. At that date there were, says *Engineering*, seven central stations fed from the installation at St. Fargeau for the distribution of electric light. They represented a total force of 750 horse-power given off by the air-motors; and of these, six were of 100 horse-power each. Four theatres, fourteen cafés and restaurants, two hotels, the same number of newspaper-offices and of clubs, and sixteen private houses were electrically lighted by the same means. Sewing-machines were driven in thirteen different establishments, ice was produced in four, and the air formed the motive power for driving machine-tools in thirty-four different shops. Sixteen printing-offices availed themselves of the same means, and in thirty-five other establishments it was also employed. Among the various applications there were a number of sanitary establishments that were on the

list of subscribers; in six instances it was employed for raising wines and spirits; it was also used for working lifts, shearing metals, and cutting stuffs, for ventilation and for driving mills, and to a large extent for wood-working machinery. At the end of last year, over 1,200 horse-power was distributed daily through the mains. Of this, 478 horse-power found employment among 276 subscribers for various industrial purposes, and 803 horse-power was absorbed in supplying 6,220 incandescent lamps and 145 arc lamps. Since that date, the demands of subscribers have gone on increasing until the reserve of engine-power at St. Fargeau was of necessity absorbed to supply the existing demands, and it became necessary to extend the main station. At the end of last year the situation of the company appears to have been as follows: the subscribers who had made themselves liable for periods of from five to ten years brought in a revenue from various industries of \$12,000; for lighting, of \$92,000; and for the pneumatic clocks, of \$19,400. Besides these, there were a number of subscribers who paid by the records of their counters. Of these, \$14,600 was paid for miscellaneous industries, and \$32,000 for electric lighting. At that time, also, several important installations were in progress which have since been finished. Among others was the Bourse de Commerce, who spent \$20,000 on an installation; refrigerating companies paying \$20,000 a year, and the Eden Theatre \$24,000 a year; there were also a number of miscellaneous applications, amounting to \$16,000 a year. These sums together brought the total revenues of the company to about \$170,000 a year, the expenses being \$152,000 for that part of the installation which was in full operation. This sum included interest on loans at 6 per cent, and interest on capital at 5 per cent. At the beginning of the year the works were not running at any thing like their full capacity, so that a large amount of capital on which interest was being paid was earning nothing. The financial condition became more favorable a short time later, when a large number of other installations were completed. It is said that this year the company will be in a position to pay regular dividends of 10 per cent upon its share capital; and, if all that is claimed for the system be substantiated, there appears to be no reason why such a rate of interest cannot be maintained or even exceeded.

Engineering does not hold itself in any way responsible for the figures given. They were furnished by the company, whose good faith is evident, because they court investigation, and are even now making arrangements for a series of trials to be conducted by wholly independent experts. Naturally the most interesting feature of the system is that by which the efficiency of the compressed air is claimed to be doubled by the application of heat and of a certain proportion of water. Apart from the inconvenience resulting on the extreme cold produced at the exhaust, for large motors at least, the permanent success or failure of the system depends upon the high degree of efficiency that can be obtained. For small motors this question is comparatively of little importance, because, even with an efficiency of 30 per cent, the balance of advantages would rest with the compressed air as compared with power produced by other mechanical means or by manual labor. The great electric-lighting installation which the company has just completed between the Rue Royale and the Opera will afford, after a few months, absolute data as to the relative economy of the system, and a means of comparison between it and the other installations of the other electric companies. Under every aspect, this great industry for the transmission of power, of which the station at St. Fargeau is the centre, is a most interesting one; and it may be predicted with certainty, that, if the reports of independent engineers confirm the statements by the company, applications on an equally large scale will soon be at work in other cities besides Paris. In a great many instances the advantage of being able to promote ventilation and to obtain a supply of pure air in the workshop is an advantage of great importance, and is one that is shared by no other medium of energy after it has done its work. Unlike the waste products from the gas-engine, or exhaust steam, or the discharged water from a hydraulic motor, the expanded air, after having done its work in the cylinder, can be turned directly into the apartment where the engine is at work. There are so many other purposes to which the system may find an application, that its field of usefulness appears to be a very wide one indeed. For

refrigerating purposes it is already in successful use in Paris, and to a modified degree it may well serve to reduce the temperature of houses in hot climates. The production of intense heat for metallurgical purposes, and the aërication of water, are also two other practical uses of which the ultimate list will probably be a long one.

HEALTH MATTERS.

The Mortality in the City of New York for 1888.

A PRELIMINARY report in relation to the mortality of the city for the year 1888 has just been presented to the board of health by Dr. Roger S. Tracy, the assistant sanitary superintendent; and the deductions made in it, as we find them summed up in the *Boston Medical and Surgical Journal*, are somewhat remarkable. The sanitary police took a census of the tenement-house population during the year, which includes all the houses that are more or less constantly under the supervision of the board of health, but not the better class of apartment-houses. The entire population included in this census was 1,093,701 persons, among whom there were 24,842 deaths, while the total number of deaths in the city was 40,175. The highest death-rate, 26.60 per thousand of the population, is in the district south of 14th Street and west of Broadway; the next highest, 23.52, is in the district west of Fifth Avenue and between 14th and 59th Streets, in which are situated a large proportion of the residences of the wealthiest citizens; and the third highest in the district east of Broadway and south of 14th Street, the most densely populated part of the city, and containing almost exclusively a tenement-house population.

The general tenement death-rate was 22.71, while the general death-rate of the city in 1888 was 26.33; and this fact would seem to indicate that the population of the city has been underestimated, and the quoted death-rate too high, or that all the deaths belonging in tenement-houses had not been credited to them, or else that the death-rate is actually lower for the tenement-house population than for the rest of the city, which would certainly seem most extraordinary. It might be that deaths that should have been credited to the tenement-houses have not been so credited; but of the total number of deaths in institutions, 7,774, the former place of residence of the individuals was ascertained in 3,444, and these deaths have all been credited to the houses in which they had lived. In all the districts the death-rate of persons five years of age and over, as a rule, decreases as the number of tenants increases; while the death-rate of children under five years of age increases up to a certain point, diminishing when there are more than eighty tenants to a house. The general death-rate is highest in houses containing from sixty to eighty tenants; and this is caused by the higher death-rate among the children, which reaches in these houses 114.04 per 1,000 living.

The results of the investigations are summed up by Dr. Tracy as follows: "The death-rate in tenement-houses is less than the general death-rate of the city. The death-rate in the large tenement-houses is less than in the smaller ones. While diarrhoeal diseases and diphtheria show a greater death-rate in the larger houses, phthisis and pneumonia show comparatively little difference; that difference, however, being in favor of the larger houses. The greatest general death-rate among persons over five years of age, the next to the highest death-rate from diarrhoeal diseases and pneumonia, and markedly the highest from phthisis, are in the district south of 14th Street and west of Broadway. The excessive mortality in this part of the city is probably connected with the great number of old houses and the dampness of the soil. These results are much at variance with what was expected. It seems to be sufficiently established that people do not live under such extremely bad sanitary conditions in the tenements as they have been supposed to."

Contagious Consumption.

The following report on consumption as a contagious disease was approved July 9 by the Health Department of New York City:—

"Pulmonary tuberculosis (consumption) is directly communicated from one person to another. The germ of the disease exists in the expectoration of persons afflicted with it. The following extract

from the report of the pathologists of the Health Department explains the means by which the disease may be transmitted:—

"Tuberculosis is commonly produced in the lungs (which are the organs most frequently affected) by breathing air in which living germs are suspended as dust. The material which is coughed up, sometimes in large quantities, by persons suffering from consumption, contains these germs often in enormous numbers. . . . This material when expectorated frequently lodges in places where it dries, as on the street, floors, carpets, handkerchiefs, etc. After drying in one way or another, it is very apt to become pulverized, and float in the air as dust."

"By observing the following rules, the danger of catching the disease will be reduced to a minimum:—

"1. Do not permit persons suspected to have consumption to spit on the floor or on cloths, unless the latter be immediately burned. The spittle of persons suspected to have consumption should be caught in earthen or glass dishes containing the following solution: corrosive sublimate, one part; water, one thousand parts.

"2. Do not sleep in a room occupied by a person suspected of having consumption. The living rooms of a consumptive patient should have as little furniture as practicable. Hangings should be especially avoided. The use of carpets, rugs, etc., ought always to be avoided.

"3. Do not fail to wash thoroughly the eating utensils of a person suspected of having consumption as soon after eating as possible, using boiling water for the purpose.

"4. Do not mingle the unwashed clothing of consumptive patients with similar clothing of other persons.

"5. Do not fail to catch the bowel discharges of consumptive patients with diarrhoea in a vessel containing, corrosive sublimate, one part; water, one thousand parts.

"6. Do not fail to consult the family physician regarding the social relations of persons suffering from suspected consumption.

"7. Do not permit mothers suspected of having consumption to nurse their offspring.

"8. Household pets (animals or birds) are quite susceptible to tuberculosis: therefore do not expose them to persons afflicted with consumption; also do not keep, but destroy at once, all household pets suspected of having consumption, otherwise they may give it to human beings.

"9. Do not fail to thoroughly cleanse the floors, walls, and ceilings of the living and sleeping rooms of persons suffering from consumption at least once in two weeks."

Ten thousand copies of the report were ordered to be printed for distribution.

PREVENTING TUBERCULOSIS BY MILITARY ORDERS.—The German war minister has decided, says *The Medical Record*, that the chest of every soldier shall be examined once a month. If the chest does not reach a certain breadth, and does not develop with drill and athletic exercises, the soldier will be disqualified, and regarded as being predisposed to phthisis, and, moreover, likely to infect his comrades.

PASTEUR'S METHOD.—In his brief report for the year ending May 1, 1889, the director of the Pasteur Institute, Paris, announces the treatment of 1,673 subjects, of whom 6 were seized with rabies during, and 4 within a fortnight after, the process. But 3 only succumbed after the treatment had been completely carried out, making 1 death in 554, or, including all the cases, 1 in 128.

PROFESSORSHIPS OF HYGIENE.—The University of Kiel, as we learn from *The Medical News*, has inaugurated a professorship of hygiene, and Dr. Bernard Fischer has been appointed to the chair. There now remain only two Prussian universities—those of Bonn and Königsburg—without such chairs. Dr. Fischer was one of Professor Robert Koch's pupils, and accompanied him on that memorable journey into Egypt and India which resulted in the discovery by Koch of the bacillus of Asiatic cholera. Another companion on that voyage was Dr. Gaffky, now professor of hygiene at Giessen. Other pupils of Koch occupy the same department of instruction in other universities, as Dr. Gärtner in Jena, Dr. Löffler in Greifswald, Dr. Hüppe in Wiesbaden, Dr.

Becker in Leipzig, Dr. Fränkel in Berlin, and Dr. Frank in Naples. These are all members of the younger generation of instructors, and are adepts in the laboratory methods of Koch. Dr. Fischer's original work has been exerted in two directions chiefly, — one in the application of bromine to disinfection, another in the study of the phosphorescence of the sea.

ELECTRICAL NEWS.

NEW FORM OF GAS-BATTERY.—This battery, invented by Mr. Ludwig Mond and Dr. Carl Langer, is an improvement on the gas-battery invented by Grove fifty years ago, which produces electricity from hydrogen and oxygen gas by the intervention of platinum. The distinguishing feature of the new battery, which has been designed to obtain large currents of electricity by means of these gases, is, according to *Nature*, that the electrolyte is not employed as a mobile liquid, but in a quasi-solid form, and it is therefore named "dry gas battery." Each element of the battery consists of a porous diaphragm of a non-conducting material,—for instance, plaster-of-Paris,—which is impregnated with dilute sulphuric acid. Both sides of this diaphragm are covered with very fine platinum-leaf, perforated with very numerous small holes, and over this with a thin film of platinum black. Both these coatings are in contact with frameworks of lead and antimony, insulated one from the other, which conduct the electricity to the poles of each element. A number of these elements are placed side by side, or one above the other, with non-conducting frames intervening, so as to form chambers through which hydrogen-gas is passed along one side of the element, and air along the other. One element, with a total effective surface of 774 square centimetres (120 square inches), which is covered by 1 gram of platinum black and .35 of a gram of platinum-leaf, shows an electro-motive force of very nearly 1 volt when open, and produces a current of 2 amperes and .7 of a volt, or 1.4 watts, when the outer resistance is properly adjusted. This current is equal to nearly 50 per cent of the total energy obtainable from the hydrogen absorbed in the battery. The electro-motive force decreases, however, slowly, in consequence of the transport of the sulphuric acid from one side of the diaphragm to the other. In order to counteract this disturbing influence, the gases are from time to time interchanged. The battery works equally well with gases containing 30 to 40 per cent of hydrogen, such as can be obtained by the action of steam, or steam and air, on coal or coke, if the gases have been sufficiently purified from carbonic oxide and hydrocarbons. The water produced in the battery by the combination of hydrogen and oxygen is carried off by the unconsumed nitrogen, and an excess of air carried through it for this purpose.

BOOK-REVIEWS.

Education in the United States: its History from the Earliest Settlements. (International Education Series.) By RICHARD G. BOONE. New York, Appleton. 12°. \$1.50.

THIS book belongs to a class that are becoming rather common in this country, books presenting a large amount of useful information in an unattractive style. The time has been when a good literary style was considered indispensable in an historical work; but in our time, and especially in this country, we are treated to volume after volume on historical themes in which style is utterly lacking. That this should be so is somewhat surprising; for a work that has no charm of style is certain to have a much smaller circle of readers than one that has that attraction, and writers usually desire as many readers as possible. In Mr. Boone's book we are sorry to find this literary defect; for the work has a good deal of merit of other kinds, conveying as it does a large amount of information for the most part well arranged. It has evidently been prepared by careful and conscientious study of the original authorities, and will be useful at least to all educators and as a work of reference to all intelligent readers. It opens with an account of the steps taken by the early colonists to establish schools and colleges, and shows how, at the very outset of our national history, the sentiments of North and South differed on this subject

of education. Massachusetts and Connecticut led the way in founding schools for the whole people, and it was not until comparatively recent times that their ideas and practice became generally prevalent. How the public-school system grew up and overspread the country, Mr. Boone relates at considerable length; and he does not fail to show how much the schools have been improved by the increase of State control. Then follows a chapter on recent progress in the colleges, showing the changes in the curriculum, the introduction of the elective system, and other matters of interest. Professional and technological schools are also treated of, and there is a chapter on the education of the deaf and dumb and other unfortunates, and of criminals. The author does not confine himself, however, to the schools alone, but gives the history of other educational agencies, such as libraries, museums, and learned societies. The founding of the Smithsonian Institution, the grants of land for educational purposes, and other acts of the general government bearing on education, are related; and the book closes with an interesting chapter on the advance that has been made in the education of women. Thus it contains a valuable mass of information, which, so far as we know, was not accessible before in a convenient form.

A Theoretical and Practical Treatise on the Strength of Beams and Girders. By ROBERT H. COUSINS. New York, Spon. 12°. \$5.

SINCE the time of Galileo, the subject of which this volume treats has received much attention at the hands of the ablest mathematicians of all countries. Many attempts have been made during the present century to solve experimentally the problems involved, only to result in the adoption, by many experimenters, of empirical rules for the strength of beams and girders, rather than scientifically deduced formulas; the reason for this, as given by one authority, being that "no theory of the rupture of a simple beam has yet been proposed which fully satisfies the critical experimenter." The theory advanced in this treatise, and the formulas resulting from that theory, deduce the strength of beams and girders from the direct crushing and tensile strength of the material composing them, leaving out of the problem altogether the co-efficient known as the modulus of rupture. The theory and the formulas deduced from it are in accord with correct mechanical and mathematical principles, and the author believes that they will fully satisfy the results obtained by the experimenter. Works of this character derive special importance from the constantly increasing use of iron and steel for building and engineering purposes.

The Beginners' Book in German. By SOPHIE DORJOT. Boston, Ginn. 12°. 90 cents.

THIS little book is the result of the need felt by the author and others, in teaching German, of suitable books to put into the hands of beginners. It consists of two parts. Part I. is a series of lessons, each of which is introduced with a picture, followed by corresponding verses from the child-literature of Germany. These pictures, which illustrate the text following, were all drawn expressly for the purpose, and are brimming with the spirit of fun and humor which they have so faithfully caught from the child-lore. A conversation upon the subject, with the study of words and phrases, completes each lesson. In this way advantage is taken of the children's tastes and inclinations, and even of the mischievous element which enters so largely into the child-nature. The second part contains graded selections for reading.

The typography and make-up are in every way excellent. The book, as a whole, forms a very attractive volume, and we have no doubt that it will prove, as the author has intended, a great relief to teachers and a source of pleasure to pupils.

The A B C of Electricity. By WILLIAM H. MEADOWCROFT. New York, F. W. Lovell. 12°. 50 cents.

CONDENSATION of matter and simplicity of language are the points most noticeable in this little volume. A brief general outline of the rudiments of electrical science, or at least of those departments of it which have now become almost a part of every-day life, is given in language devoid of those technicalities which are

so puzzling and discouraging to the general public, though necessary to the student and the electrician. The author does not put it forward as a scientific work, of which there is no lack, intending it only as a sort of guide-book on the road to electrical science, which will probably give to many the information they may desire, without requiring too great a research into works which treat more extensively and deeply of the subject. The book bears the indorsement of Thomas A. Edison.

AMONG THE PUBLISHERS.

AMONG the timely articles in the July number of *The New Review*, which Longmans, Green, & Co. expect to have ready about the 12th, are "The Eiffel Tower," by M. Eiffel himself; "The Shah of Persia," by Lord Castletown; and "The Eight Hours Bill," by Mr. Charles Bradlaugh. There will also be an anonymous article on "The Talkers of London." Matthew Arnold's literary executor, Lord Coleridge, has written a paper on the lamented poet and critic, which will appear in the July number of *The New Review*.

— The July number of *Blackwood's* will contain a story by Mr. Oscar Wilde on the subject of Shakspeare's sonnets. Mr. Wilde will put forward an entirely new theory as to the identity of the mysterious "Mr. W. H." of the famous preface.

— John Wiley & Sons have just ready a work on "Steam-Engine Design," for the use of mechanical engineers, students, and draughtsmen, by Professor J. M. Witham.

— Ticknor & Co. announce "The Moral Idea: a Historic Study," by Julia Wedgwood, — a work which is said to be the outcome of twenty years of study, and which is described as "a history of human aspiration after a moral ideal that changes continually in the evolution of time and thought, the highest truth discovered by one age being often found by a revolt against the errors circling round the belief that was the life of a former age."

— D. Appleton & Co. have ready "Days Out of Doors," by Charles C. Abbott, a companion volume to his "A Naturalist's Rambles about Home;" "The Garden's Story," by George H. Ellwanger, relating the pleasures and trials of an amateur gardener, illustrated with head and tail pieces by Rhead; and "The History of a Slave," by H. M. Johnston, author of the "Kilimanjaro Expedition."

— In the July issues of the leading English reviews, Mr. Gladstone contributes to the *Nineteenth Century* an article entitled "Plain Speaking on the Irish Union." Mr. Gosse writes on "Edward FitzGerald," the translator of Omar Khayyūm, in the *Fortnightly*; and Walter Besant describes the first society of British authors (1843) in the *Contemporary Review*. This last-named periodical will contain, in addition to other notable articles, a paper on "Jewels and Dress," by Mrs. Haweis; and one on "Thomas Hardy," by J. M. Barrie.

— Messrs. Belford, Clarke, & Co. send us two of their lately published novels, — "The Prophet's Mantle," by Fabian Bland; and "Trean, or The Mormon's Daughter," by Alva M. Kerr. The former is much better than many recent novels, being not only unexceptionable in both a moral and a literary sense, but really an entertaining story. The leading character is a Russian nihilist, but the scene is mostly laid in London. The incidents are mostly of an ordinary kind, only a few being unusually exciting; yet the interest is unflagging from beginning to end. A good deal is said by the various characters on the subjects of socialism, capitalism, tyranny, and the urgent need of social re-organization, and the author seems to be more or less in sympathy with socialistic views, but with some doubts about their practicability. The other novel is inferior to "The Prophet's Mantle," but has nevertheless an interest of its own. The hero of the tale is an eastern man, who goes on business to Utah, and there falls in love with a Mormon's daughter. A Mormon bishop, however, who already had several wives, was bent on adding that same girl to the list; and hence arose a host of trouble for the young lovers, out of which, of course, they at last emerged triumphant. The book contains a great deal about the Mormon doctrines and practices — most readers will

think too much for the interest of the story; and the author is evidently a determined hater of the whole Mormon system. Almost every novel nowadays endeavors, as these do, to deal with some moral or social question, either by showing in a vivid light some evil that requires a remedy or by rousing a public sentiment in favor of reform. This tendency, if properly directed, is certainly to be welcomed; for it makes the story not only more useful and improving, but also to men of intelligence more interesting.

— Messrs. Ginn & Co. announce for early publication "Pages Choiesies des Mémoires du Duc de Saint-Simon," edited for use in colleges and advanced classes, and for private readers, by Alphonse N. Van Daell, Ph.C., LL.D., recently director of modern languages in the Boston High and Latin Schools, and now professor of French in the Massachusetts Institute of Technology. The "Mémoires of Saint-Simon," which are of great importance for both the literary and the historical study of the seventeenth century in France, are accessible to but few students, partly on account of their bulk. The editor does not know of any American edition, although it is very desirable to have Saint-Simon's prose studied in an advanced course. The notes will be in French; and the introduction will consist of two selections, — one from Taine, the other from Rambaud. The same firm also announce for publication in August, Dumas' "Les Trois Mousquetaires," edited by Professor F. C. Sumichrast of Harvard University, for use in schools and colleges and for private readers. Alexandre Dumas was one of the brightest and most entertaining of writers; but his works, with the exception of "La Tulipe Noire," have not been available for college or school work on account of their length and the frequent occurrence of objectionable passages. These two objections are removed in this edition of Dumas' masterpiece, "Les Trois Mousquetaires." The story itself is kept intact, and the brilliant description of court, camp, and city life preserved; but the "padding" has been omitted, and its place supplied by brief summaries. Every objectionable page has been carefully excised, and this with the greater readiness that the actual story is not thereby affected. The book will form a volume of about two hundred pages of reading-matter, and, being fully annotated, will prove an edition serviceable to student and teacher alike.

— The *Forum* for July contains eleven articles on a great variety of subjects and of varying excellence. The most important is the opening one, by Bishop Henry C. Potter, on "The Scholar in American Life." The writer justly thinks that the American people are greatly in need of a much higher grade of scholarship than now prevails among them; and in this essay he endeavors to show this need, and also to point out the conditions on which alone it can be supplied. By scholarship Bishop Potter does not mean the mere possession of knowledge: on the contrary, he speaks slightly of those who merely retail other men's ideas. It is the original thinker, the teacher of new truths, whom he designates as the scholar, and whose work he regards as so important. At present such men are rare in this country, and those of the highest class are not found here at all; and Bishop Potter doubts if we shall have them in any considerable numbers until our universities provide, either by fellowships or by lectureships, for their support. The whole paper is well considered, and ought to be read and pondered by all who have the interests of American civilization at heart. Mr. W. S. Lilly continues his series of papers on what he deems the moral looseness of the present age, treating this time of "The Ethics of Journalism." He contrasts the ideal of the journalist's profession with the reality, and it cannot be denied that the charges he brings against the common run of journalists have a solid basis of fact. Professor G. J. Romanes replies briefly to Mr. Mivart's criticism of the Darwinian theory, but without saying anything that is new. Dr. Austin Flint has a paper on "Late Theories concerning Fever," in which he considers especially the mode of treating that disease. He remarks that the increase of temperature is the really dangerous element in the case, and, while he speaks somewhat hesitatingly about the use of drugs for reducing the temperature, recommends in strong terms the application of cool baths. M. Honoré Beaugrand writes of "The Attitude of the French Canadians" on the questions of commercial union and annexation to the United States. He replies to Professor Goldwin

Smith's strictures on the French people of Canada; and while he admits that they are less successful in accumulating wealth than men of the Anglo-Saxon race, and that they are too much under the influence of the priests, he maintains that they are, on the whole, as good citizens as any others. On the question of annexation, he thinks the French are tending toward a decision in its favor, largely because so many of them have already settled in New England, and so have become familiar with life in the States. Mrs. J. C. Croly writes on "Domestic Service," expressing the opinion that mistresses usually expect too much of their servants,—as much as could be expected of trained experts; and, furthermore, that the servant-girl is too often not treated, as she should be, like any hired laborer, but rather as a dependent. To these causes Mrs. Croly attributes many of the troubles that ladies have with their servants. The other papers in the *Forum* deal with familiar subjects, and call for no special remark.

— It cannot be said that in these days there is any lack of high-class reviews, but their cost is prohibitive to the great mass of the people. A high standard of excellence, and a cultivated literary taste, are no longer confined to the few; while a keen anxiety to become acquainted with the ideas of the foremost men of the day on the many vital problems now before the world is developing among a class unable to purchase the periodicals in which alone these subjects are handled. The object of *The New Review* (Longmans, Green, & Co., London and New York) is to place a critical periodical of the first order within the reach of all; and the preliminary list of writers is a sufficient proof that it will not yield to any in the eminence of its contributors. The public will be brought into direct contact with the most representative men of the age. Politics, science, and art will be treated by writers of acknowledged repute; and literature, both critical and creative, sober and fanciful, will be associated with names which have long carried their own commendation. Brevity as well as cheapness will be one of the distinguishing features of the new enterprise. The second number, to be published early in July, will contain, "The Shah," by the Right Hon. Lord Castletown; "Matthew Arnold," by the lord chief justice of England; "The Eiffel Tower," by M. Eiffel; "The Eight Hours Bill," by Charles Bradlaugh, M.P.; "The Higher Policy for Africa," by Sir G. Baden-Powell, M.P.; "The Talkers of London;" "Greyfriars," by St. George Mivart,

F.R.S.; "The Dying Drama," by William Archer; "Three Types of Womanhood," by the Countess of Cork.

— A natural-history serial, "Among the Florida Keys," by Charles Frederick Holder, describing the strange adventures and observations of a party of boys during a vacation trip in Florida, begins in the July number of *St. Nicholas*, and will continue for four months.

LETTERS TO THE EDITOR.

*.*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

The editor will be glad to publish any queries consonant with the character of the journal.

Queries.

45. IS THE HUMAN VOICE GROWING, OR DECAYING? — In his article on speech and song, in the *Contemporary Review*, Sir Morell Mackenzie writes, "Before leaving the subject of the speaking voice, a word or two may be said on what is more a matter of curious speculation than of practical interest. Is the human voice growing in power and beauty, or is it tending to decay? Certain physiologists assure us that the retina has acquired the power of distinguishing colors by degrees, and that the process will probably continue, so that our descendants will by and by evolve the power of seeing colors now quite unknown to us. On the other hand, it is undeniable that civilization, so far from increasing the keenness of our sight, threatens to make spectacles universally necessary. There can be no doubt that the voice has developed greatly since our 'half-human ancestors' wooed each other in the primeval forests, and it is conceivable that it may in time to come acquire the power of producing musical effects at present undreamt of. It is also probable enough, that, as the voice gains in sweetness, it may lose in power, the latter quality being more required in barbarous than in highly civilized conditions. On the other hand, we are taller and of larger chest-girth than our predecessors even of a not very remote date: it is reasonable, therefore, to suppose that the average lungs and larynx are bigger nowadays, and the air-blast from the lungs stronger. This would appear to justify us in believing that the voice is stronger than it was even two or three centuries ago. There are, however, no facts that I know of to prove it." Cannot some of the readers of *Science* throw light on this?

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INDUSTRIAL NOTES.

The Popularity of Electric Cars.

It is extremely interesting to note that a few evenings ago a mass meeting of citizens was held in Cleveland, O., to urge the extension of the electric-railway system in that city. When the East Cleveland Street Railway Company, about a year since, proposed to install an electric line of cars on Euclid Avenue and several other principal streets in that city, there was a general protest by the residents along the proposed route who had never seen any lines in electrical operation, and others, against the erection of poles and overhead lines. Objections to railway pole lines in cities where there have been no electric cars are natural, in view of the kinds of pole lines which are often installed by telegraph and telephone companies; but, as the intention of the East Cleveland Street Railway Company was to install iron poles, the objections were finally overruled, and the line was equipped with the overhead system, using iron poles, and operating sixteen Sprague electric cars. The route extended over some of the handsomest residential streets and principal business thoroughfares, and used the regular Sprague overhead system, with the small No. 6 silicon bronze trolley wire as a working conductor, carrying the main portion of the current on an insulated main wire at the side of the street. The success of the road has been marked from its very start. The residents have been given a method of transit more convenient and more rapid than they had ever before enjoyed, without any disfigurement of the streets by hideous elevated-railroad structures. The system rose rapidly in popularity with residents and property-owners as its advantages became recognized, and real estate along the route of the electric railway increased greatly in value, in a number of cases bringing double or triple its former price. With this change there was a very noticeable change in the tone of the Cleveland press, which rapidly changed from a spirit of opposition to the electrical method of rapid transit to a spirit of friendliness and approbation. The railway company have already increased their equipment, adding eight more to their original order of sixteen cars from the Sprague Company.

The meeting held the other evening was largely attended, and was for the purpose of urging the railway company to still further extension of their line, and to simplify their facilities of rapid transit. The meeting in Doan's Armory on Euclid Avenue, Cleveland, was presided over by Mr. W. E. Sherwood. After the announcement of the purposes of the meeting, which was received with great enthusiasm, a committee, consisting of Judge E. M. Heisly, Gen. Edward S. Meyer, and Mr. George H. Foster, were appointed to draw up a resolution.

The resolution which was presented by these gentlemen, and which was unanimously adopted, read as follows: "*Resolved*, That it is the sense of this meeting that the public convenience of the city of Cleveland requires and demands that the electric-motor system shall be extended to the Public Square, and, if necessary to that end for the East Cleveland Railroad, that it lay its tracks on Euclid Avenue from Case Avenue to the Public Square, if consent can be obtained; and the gentlemen present pledge themselves to do all in their power to obtain that consent for the company."

This action of the citizens of Cleveland is simply another example of the popularity of the electric system of street-car propulsion in every city where it has been adopted.

Electric Rapid Transit in Cleveland.

Among the cities which are rapidly coming to the front as leading in rapid-transit facilities by the application of electricity, there is none, perhaps, where the advantages of electric power for street-cars are more thoroughly recognized than in the city of Cleveland, O. Though it is only about nine months since the first electric cars were put into operation upon the streets of that city, the Cleveland public have become enthusiastic over this method of transit, and the number of electric cars in that city is rapidly extending.

Last week a new extension to the East Cleveland Electric Railway was opened in Cleveland on Prospect Street and Euclid Avenue, and the first car ran over the line with the president and

secretary of the road, and electricians in charge, as freight. It is the intention of the East Cleveland Company to operate sixty motor-cars on this line with two minutes and a half headway, and all horses will be removed from the line as soon as the motor-cars are equipped with the Sprague motors which have been ordered.

It is said that the experiment will be tried of running these cars at the rate of about eleven miles an hour through the city; and it is not thought that the city council will object to this, since it is a well-known fact that electric cars operated at this speed are much safer to the general public than horse-cars run at only six miles an hour, as the electric cars can be stopped very much more quickly than cars propelled by animal power.

It is an interesting fact, in connection with this road, to note the popularity of the electric cars with the passengers and property-owners along the line. In Cleveland, at a public meeting recently, which was presided over by some of the most prominent citizens, resolutions were passed commenting on the successful operation of the Sprague electric road; and the East Cleveland Company was requested to extend the motor-line in several directions, in order to improve the transit facilities. These resolutions were adopted unanimously by the large number of citizens who were present.

The equipment of the East Cleveland Company includes, besides a number of the old type of Sprague motors, a number of cars equipped with the new style of motors, and the additions to the equipment will be all of this class of motor. Cleveland deserves a prominent place among the leading "electrical cities" on this continent.

A Pioneer Electric Line Re-organized.

One of the first electric street-railways in this country, the Washington Street, Asylum, and Park Railway of Binghamton, N.Y., has recently had its entire equipment changed, in order to meet the latest and most approved ideas of electric-railway science. The first equipment was installed about two years ago, and the changes which are being made illustrate the advances which have been accomplished in electric-railway science, and they show the difference between the ideas which were prevalent two years ago and those illustrated in the motor appliances of to-day.

The motor cab, which occupied the front of the car under the old style of electric railway, will be entirely dispensed with, and the motors will be placed underneath the cars, as in all the modern electric railways. The overhead overrunning trolley, and the method of carrying all the current over the track on a single conductor, have been abandoned for the latest Sprague methods in this case. The motive power also will be under the more complete control of the driver, and all degrees of speed in both directions are obtainable by movements of a single switch, so that the car can be propelled either backwards or forwards with equal ease and rapidity.

The cable-lines, which formerly it was found necessary to operate at either end of the road on account of the heavy grades at these points, will be things of the past, as the Sprague motors will be of sufficient power to propel the cars up these grades; and the trip from one end of the line to the other will be made without change.

It is interesting to note the increase of efficiency of the motors, as indicated by the statement which is made, that the management of the railway company has completed a contract for power at nearly one-half less than the amount called for by the previous contract.

The cars will each be equipped with Sprague improved motors of 15 horse-power each, with all the latest improvements and devices in use by the Sprague Company upon any of the roads equipped with their machines. These cars will each be able to tow one ordinary car. The re-organization and re-equipment of this road are applauded by the citizens and papers of Binghamton, who anticipate improved rapid-transit facilities on the new road.

How to take Money to Europe.

Messrs. E. J. Matthews & Co., 2 Wall Street, New York, the American agents of the Cheque Bank, Limited, of London, have issued a little pamphlet containing a list of tradespeople who will accept checks of the Cheque Bank as cash in payment of bills.